

## **Class based storage assignments for miniload ASRS with openrack structure**

### **Abstract**

Automated Storage and Retrieval Systems (AS/RSs) are warehousing systems that are used for the storage and retrieval of products in both distribution and production environments. This paper presents an open-rack structure with unidirectional-upward mobile loads within the rack, for miniload AS/RS, in which the stacker crane is only used for the retrieval operations, and the storage operations are carried out by separate devices namely, storage platforms. Heuristics algorithms and models are developed for load shuffling and travel time of the storage platform, respectively. The well-known ABC approach is used to classify inventory items for determination of class-based storage assignments. Then the expected travel time of the proposed AS/RS is derived. The travel time model and the performance of proposed AS/RS are validated using Monte Carlo simulation and are compared with a conventional one. The results show that the open-rack AS/RS represents a higher performance and the proposed models are reliable for the design and analysis of this kind of AS/RS.

**Keyword:** Automated storage and retrieval systems (AS/RS); Open-rack structure; ABC approach; Travel time; Monte Carlo simulation